

Further study must be made before it will be known if the last two are perhaps endemic to the lomas. The most common species are: *Polypodium pycnocarpum*, *Adiantum subvolubile*, and *A. digitatum*; others are: *Ophioglossum petiolatum*, *Anogramma leptophylla*, *Woodsia montevidensis*, *Notholaena peruviana*, and *Adiantum Poiretii* (vars. *hirsutum* and *sulphureum*).

About 80 percent of the species of flowering plants on the lomas are endemic and the few, or no, endemics among the ferns is in striking contrast. This may be due to a slower rate of evolution among the fern species but I think that it is more likely that it reflects their superior means of dispersal. It is quite possible that, from the Andes, spores of these species reach the lomas with sufficient frequency to negate the effects of their geographic isolation.

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### Survival of Hart's-tongue Fern in Central New York

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One hundred and fifty years after the hart's-tongue, *Phyllitis scolopendrium* (L.) Newm. var. *americana* Fern., was first reported in America, at Split Rock, New York, July 20, 1807, by Frederick Pursh, it is still persisting at least in the immediate vicinity. Trees which shaded it have been cut, a TNT explosion took place near by, and quarrying has destroyed many of the

sheltering rocks. To be sure, the plants are not luxuriant but they will probably remain until man completely changes the habitat. When this station was rediscovered September 30, 1879, by the Syracuse Botanical Club, Charles Peck, who had been convinced that this station had long been destroyed, wrote then: "Pursh has been vindicated and botanists everywhere will rejoice. I regard this rediscovery of the *Scolopendrium* in its original locality after a lapse of more than seventy years as scarcely less important than the discovery of the *Epipactis*. It shows conclusively the persistence of species when left alone."<sup>1</sup>

Reports of the numbers, or more often of the thriftiness of the plants in the stations, have been given from time to time but not until 1916 was an organized census taken. Mabel Hunter (1922) fortunately chose the Jamesville Woods substation in Clark Reservation. In 1920 she repeated the census, found the plants increasing, and suggested that the census be a yearly one. Not until 1936 was another organized census taken in the Reservation by Lillian R. Sedgwick, David Caldwell, and myself. Since then this has been continued every five years with the assistance of botany students at Syracuse University and a number of members of the Syracuse Botanical Club—Lillian Sedgwick, Nettie M. Sadler, Mrs. Ellis Hinman, and Eleanore Porter. Because of the growth on talus we felt it would hinder survival to go into the area each year.

#### DISTRIBUTION AND HISTORY

In central New York the native localities are still restricted to Onondaga and Madison Counties, where the ferns grow on talus slopes of glacial ravines and plunge basins. Coolness is the outstanding characteristic of all the ravines. The cool air pockets with the associated northern plants of the White Lake areas are well described by Petry (1918). The plants grow in the black humus of the beech, maple, hemlock, and yellow birch forests well below the overhanging ledges (largely of Onondaga lime-

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<sup>1</sup>Letter (in Syracuse University) to Mrs. Myers, Oct. 3, 1879, Albany.

stone) on east- and north-facing slopes or in similar shaded areas.

A summary of the history as given by Maxon (1900) and Hunter (1922) is outlined below. The Roman numerals are used for Hunters' stations and colonies and capital letters for sub-stations.

- I. GEDDES (SPLIT ROCK) (Pursh, 1807)
- II. CHITTENANGO FALLS (Cooper, 1830?)
- III. PERRYVILLE FALLS (Ledyard, 1898)
- IV. JAMESVILLE
  - A. HOWLETT'S GORGE (Foote, 1866)
  - B. LITTLE LAKE (GREEN LAKE)
    - I—Colony (Paine, 1866)
    - II—Colony (Hunter, 1920?)
  - C. GREEN POND (Paine, 1866)
  - D. ROCK GORGE (Maxon, 1900?)
  - E. WEST WHITE LAKE (Petry, 1918)
  - F. EAST WHITE LAKE (Todd, 191?)
  - G. EVERGREEN LAKE (Petry, 1920)
  - H. JAMESVILLE WOODS (Maxon, 1900)
    - I-VI Colonies
- V. MUNNSVILLE (Stebbins, 1934) (Page?)
- VI. BALDWINVILLE (Larsen, 1959)

Stations I, IV and VI are in Onondaga and II, III and V in Madison County.

About 1900, H. D. House transplanted several of the plants from Chittenango Falls to a ravine near Munnsville. These persisted until at least 1920 (Hunter 1924) but probably disappeared soon afterwards and were not found in 1946.

By 1924, West White Lake was "covered with the blastings of quarrying operations" (Hunter 1924) and Green Pond, often called "Scolopendrium Lake" because of the abundance of the fern, was in the direct line of quarrying. In December united efforts were made to have this unusual White Lake area preserved and included in the Clark Reservation but when these failed the owners were persuaded to hold off operations until the hart's-tongue could be saved and many transplanted in the Reservation (Hunter 1924) (House 1926). Over 1000 plants

were transplanted by the summer of 1925. Some 350 placed in a ravine east of the steps were washed out the spring of 1925; around 360 were planted in Colony VI of the Jamesville Woods substation and others in original or other ravines throughout the park. The Green Pond was destroyed in 1925. East White Lake was in the line of quarrying and was half filled in in the late thirties, and so no more hart's-tongues.

Through the efforts of the Syracuse Botanical Club an amendment to the State Law was passed in 1930 to protect the hart's-tongue in these two counties. During the thirties the trees around the Rock Gorge substation were cut, so that by 1942 there was only one mature and two young plants and these were gone before 1945. In 1934 Stebbins (1935) found two well-established plants in a ravine near Munnsville. For a while this was believed to be a native area and thus the region was extended to the east. Drs. House and Maxon had searched for the fern in this locality years before with no results. It was suggested by Dr. Robert Crockett that it was probably planted by the late Mr. Page. We consulted Dr. House and he consulted the son of Mr. Page, who said that his father did plant some in that vicinity. On November 15, 1946, Eleanore Porter, Nettie Sadler, and I found a very characteristic ravine, not with two, but with two groups of the ferns, one with nine and the other eleven mature plants. This is some distance west of the ravine where Dr. House planted some much earlier.

The most recently reported station VI was found by Michael J. Larsen in the vicinity of Baldwinsville, in October, 1959. There was one large plant with about twelve large leaves with many sori. It is on a north-facing bank of a cool ravine where many of us have botanized without seeing it. It is about ten miles northwest of the original Split Rock station.

#### METHODS OF THE CENSUS

The census now taken every five years from 1936 through 1956 follows that of Hunter, in which the counts included three groups, mature plants which had at least one leaf with sori,

TABLE I

## IV. JAMESVILLE STATION

## H. JAMESVILLE WOODS SUBSTATION

Colony	1916 (After Hunter)	1920	1928	1936	1941	1946	1951	1956
I	159	197		100	159	125	164	249*
II <sup>1</sup>	109	115		53	159	130	253	783*
III	17	8						
IV <sup>1</sup>	119	206		129	258	307	583*	272
V	29	20						
VI	136	92	418 <sup>2*</sup>	108	91	73	110	89
Totals	569	638		390	667	635	1110	1393*

## B. LITTLE LAKE (GREEN LAKE) SUBSTATION

I		40+		3	4	19	52*	9
II		50		93	132	175	438*	255
Totals		90		96	136	194	490*	264

Totals for Clark reservation		728		486	803	829	1600	1657*
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\* Highest count.

<sup>1</sup> Colonies II & III and IV & V combined in 1936 because of fluctuation of areas.<sup>2</sup> About 360 transplanted to colony VI in 1925.

young plants (we consider those one inch and more in length and without sori, whereas Hunter considered leaf-shape), and sporelings and prothallia. Whenever possible the counts were made from the bottom toward the top of the ravines, as the young ones can be seen more readily and there is not as great a hazard for the plants. Counts were made during the late fall or early spring. The former is better, after the early frosts when the tall herbs, like *Impatiens*, are killed and before the snowfall.

#### RESULTS AND DISCUSSION

Table I shows the census of mature plants in the ravines of Clark Reservation from 1916 until 1956. The fluctuation in counts is to be expected in a plant of such restricted range and the counts, having been made at five year intervals instead of yearly, show an incomplete picture of survival. Miss Hunter found an growth of 12.1% in the Jamesville woods substation in the years between 1916 and 1920. This shows a trend toward conservation since before this people were free to pick and distribute plants and areas were being cleared and burned. It is encouraging to see the gradual but fairly constant increase from 1936 through 1956. The history of the area will help to explain the 16 years between 1920 and 1936 with its general reduction in numbers. Certainly the destruction of half of the Jamesville stations would lower the count in general but the transplants should have aided the increase in the park. However, plants become established very slowly; the early Thirties were very dry, and many of those which had apparently become established could not endure this drought. For example, colony VI seemed to maintain its transplants at least until 1928. The very evident rise in numbers throughout the preserve from 1941 until the present can be due in large part to the passage of the 1930 law protecting the ferns and to the constant alertness of the park ranger, Mr. Ryan, during many years. Most of these canyons are out of the direct line of any of the paths in the park. With the moving of the steps farther away from colony I of Green Lake these plants seem to be increasing. We have noted, as did Miss

Hunter, that sometimes during dry seasons the prothallia will be more abundant when the mature plants, which are more exposed, are drying. Also there is a decided shift in the location from year to year or between counts. That is the reason we had to combine some of the colonies. They are in anastomosing canyons and it is almost impossible at times to separate the colonies. Occasional yearly counts have helped to show a slight correlation between the number of prothallia and mature plants the following year. In 1946, we had a cool rather dry summer with many cool nights and there were a large number of prothallia in most of the ravines. The highest number of plants for all the stations was in 1951. Not only are the numbers increasing but the plants are "thriving." In 1945, one plant in the park had 133 old leaves and with 127 new leaves unrolling in the spring. These were 3.5 inches wide and some 26 inches long. These ravines will probably never have the moisture and coolness accompanied by the rare northern plants of the White Lake area but they will thrive under the present protection of the park.

Survival outside of Clark Reservation is difficult to predict. In 1951, there were 216 plants in the stations outside as compared with 1600 in the park. Chittenango Falls is the only other station in a park. Unfortunately, a path was cut through one colony, which was destroyed by 1956. The other area is decreasing since a clearing was made near it. Perryville Falls has never had many plants and they are small with narrow leaves. It has improved since many of the raspberries are being replaced by trees. Munnsville remains the same. Howlett's which had 87 plants in 1925 had 3 in 1956 and 9 the following year. It is in one of the most exposed areas and near a path. Evergreen Lake, the only one left in the destroyed White Lake Area, is owned by people who are interested in preserving it. With a count of more than 50 when discovered by Dr. Petry in 1920 it had 73 in 1951. The original area at Split Rock continues to maintain itself, but the plants are small. However in 1951 there were 11 mature, 60 young, and 105 prothallia.

## SUMMARY

1. Two new stations for hart's-tongue have been discovered in central New York since 1922. One is apparently a planted one and the origin of the other is unknown.

2. The number of plants in the stations in Onondaga and Madison counties have been counted at five year intervals from 1936 until 1956.

3. The number of mature plants in Clark Reservation as charted from 1916 until 1956 shows a decided increase.

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## Ferns and Allies in Kansas

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Kansas is a state characterized by cycles of drought and good moisture years. Summers result in the drying of habitats to a point where only a few localized spots remain moist. In periods of drought, often lasting for a period of years, even the most protected habitats dry completely. Thus ferns have a very local distribution and only a few of the most common species are of somewhat general occurrence; a protected habitat insuring a moisture supply is a necessity. All habitats, whether limestone or sandstone, are neutral or above in ph. with the result that rock inhabiting species are found on both limestone and sandstone cliffs, except for *Cheilanthes feei* and *Pellaea dealbata*, which occur only on strictly calcareous sites.

In the eastern half of Kansas rocky wooded hillsides, particularly those with at least small rocky cliffs, have a fern flora.